



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,235	03/24/2004	Akira Sakai	119232	4501
25944	7590	05/23/2005	EXAMINER	
OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320			PERT, EVAN T	
			ART UNIT	PAPER NUMBER
			2826	

DATE MAILED: 05/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/807,235

Applicant(s)

SAKAI ET AL.

Examiner

Evan Pert

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The specification is objected to for a lack of enabling written description to “mix...throughout” and/or to form “minutely polycrystal or amorphous” by being “epitaxially grown.”

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to make the claimed film in accordance with the claimed method of the invention.

Applicant now claims that “constituent elements” of the “substrate” are “mixed *throughout*” the “metallic oxide film of high dielectric,” which is different than Osten et al. (High-k Gate Dielectrics with Ultra-Low Leakage Current Based on Praseodymium Oxide), who shows that constituent elements only appear at an interface layer between the Si substrate and the Pr₂O₃ dielectric, the thin interface layer being made up of Pr-Si-O about 0.5 nm thick (“Crystallographic Structure”).

Yet, applicant does not disclose any methodology specifically different than Osten et al.'s method, in that an "epitaxial growth of metallic oxide" is performed (i.e. MBE growth) followed by "thermal treatment," which is the same as applicant's invention per [0006] and [0007].

Applicant states that the constituents are "easily mixed" by thermal treatment [0016] + [0006], and that by means of thermal treatment, "the intended metallic oxide film can be polycrystal or amorphous" [0007].

However, applicant does not give any specifics that make sense in view of the articles to Osten et al.: One of ordinary skill is not instructed adequately how to render the film amorphous by heat treatment or how to mix constituents from the substrate "throughout" the oxide dielectric layer being formed:

As evidence of a lack of enablement, for example, in the article entitled "Epitaxial Praseodymium Oxide: A New High-k Dielectric," the point is made that "epitaxial" oxide is NOT amorphous, which is evidence that claim 9 is not enabled: In Osten et al., epitaxial oxide is grown and then thermally treated at 600°C in dry nitrogen for 5 minutes ("Experimental"), resulting in a crystalline Pr_2O_3 film that does not change from a 1000°C anneal (D. "Thermal Stability"). According to applicant, a 1000°C anneal for 15 seconds should cause "mixing throughout," but doesn't in Osten et al.. The disclosure is unclear as to what is different about applicant's claimed "thermally treating" as compared to Osten et al.'s thermally treating: What does applicant do in addition to Osten et al., or differently than Osten et al. to get a "mixing throughout" or to get a film that is "minutely polycrystal or amorphous"?

According to the evidence of the Osten et al. articles, an epitaxial layer of Pr_2O_3 subjected to a 600°C anneal for 15 minutes followed by a test at 1000°C for 15 seconds shows “no mixing” and is not “amorphous.” So what is it that applicant does differently if mixing should be so “easily performed” at 1000°C ? What is it about applicant's “thermally treating” that is so different from Osten et al. that one gets a structurally different film altogether?

Applicant states that there are different *results* (i.e. “not crystalline” and “mixing throughout” contrary to Osten et al.), yet applicant omits necessary enabling details to arrive at the claimed *results*:

To enable claims 11 and 13, how does applicant not get a Pr-Si-O interface layer that occurs when epitaxial Pr_2O_3 is thermally treated at 600°C in nitrogen for 15 minutes per the Osten et al. article?

To enable claims 9, 14 and 20, how does applicant “epitaxially grow” a layer and then “thermally treat” to get a layer that is not crystalline, but is rather “amorphous” or “minutely polycrystal”?

To enable claims 1-19, how does one of ordinary skill in the art “thermally treat” to get “mixing throughout” as claimed, contrary to Osten et al. wherein steps that are deemed appropriate by applicant for “mixing throughout” are followed (e.g. 600°C for 15 minutes in nitrogen with 1000°C for 15 second test), but mixing throughout does not occur.

Looking to Fig. 2 of either Osten et al. reference, no interface layer is shown, but what is particularly different about the “thermally treating” disclosed by applicant as compared to the thermally treating disclosed in Osten et al.?? What does one of ordinary skill need to know about applicant’s thermal treatment to eliminate the Pr-Si-O interface discussed by Osten et al.?

If constituents are “mixed throughout,” how does Pr-Si-O take on a high dielectric constant compared to Pr_2O_3 ?

Looking at applicant’s example of [0024], the epitaxial Pr_2O_3 was heated at 1000°C for 30 seconds after being grown, compared to Osten et al. where the epitaxial Pr_2O_3 was heated at 600°C for 5 minutes in dry nitrogen, wherein a subsequent test at 1000°C for 15 seconds showed no changes. Clearly, the 1000°C heating for test caused no changes in Osten et al., but applicant *contrarily* states that heating at 1000°C causes mixing to be “*easily performed*,” so there is an absolute contradiction to Osten et al.. If there were no changes by 1000°C in Osten et al., did the 600°C at 5 minute anneal prevent the claimed “mixing throughout” at 1000°C ?

Why doesn’t “mixing throughout” occur in Osten et al. when both “epitaxially growing” and “thermally treating” occur?

Why doesn’t the “crystalline” oxide of Osten et al. form as amorphous or polycrystal, when Osten et al. perform steps of “epitaxially growing” and “thermally annealing”? What does one of ordinary skill in the art need to do to control whether the oxide is “minutely polycrystal” or “amorphous”?

Applicant indicates that crystallinity is controlled by the annealing [0007], but there are no enabling details disclosed. Different temperatures? Heating rates? Atmosphere?

What is it that one of skill needs to know different from Osten et al. to "mix throughout" (i.e. claims 1-19) and/or to form "minutely polycrystal or amorphous" (i.e. claim 20)?

Applicant is reminded and advised that new matter may be added in a continuation-in-part application claiming priority to the instant application.

Conclusion

3. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969.

The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ETP
May 19, 2005


EVAN PERT
PRIMARY EXAMINER